

Claims

1. An autostereoscopic display apparatus comprising:
 - a spatial light modulator comprising an array of pixels arranged in rows and columns in a pixel plane, the pixels comprising pixel apertures having gaps therebetween with the gaps between the columns of pixels extending substantially parallel to the columns of pixels; and
 - a spatially multiplexing parallax element capable of directing light from successive columns of pixels towards successive ones of two or more viewing windows
 - 10 in a nominal window plane,
 - wherein the pixel apertures are arranged so that across two adjacent columns the convolution in a direction perpendicular to the columns of:
 - (a) the intensity profile of an image of a nominal human pupil in the nominal window plane formed in the pixel plane by the spatially multiplexing parallax element,
 - 15 and
 - (b) the total height of the pixel apertures parallel to the columns of pixels varies by at most 5% of the maximum of the convolution.
2. A display apparatus according to claim 1, wherein the pixel apertures repeat at 20 a pitch substantially equal to a representative width of said intensity profile.
3. A display apparatus according to claim 2, wherein the pixel apertures of pixels of each colour have substantially the same, constant total height parallel to the columns of pixels.
- 25 4. A display apparatus according to claim 3, wherein the pixel apertures of pixels of different colours have substantially the same total height parallel to the columns of pixels.

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5. A display apparatus according to any one of claims 2 to 4, wherein the pixel apertures of pixels of each colour have substantially the same width perpendicular to the columns.
- 5 6. A display apparatus according to claim 5, wherein the pixel apertures of pixels of different colours have substantially the same width.
7. A display apparatus according to claim 5, wherein the pixel apertures of pixels of different colours have different widths to compensate for chromatic aberration.
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8. A display apparatus according to any one of claims 2 to 7, wherein along the rows of pixels, the pixels are arranged in groups consisting of a plurality of adjacent pixels of the same colour.
- 15 9. A display apparatus according to claim 8, wherein the pixels of each group are commonly addressable.
10. A display apparatus according to any one of claims 2 to 9, wherein said representative width is the width between the 5% and 95% cumulative integration points
20 of said intensity profile.
11. A display apparatus according to claim 1, wherein the total height of the pixel apertures parallel to the columns of pixels varies.
- 25 12. A display apparatus according to claim 11, wherein the total height of the pixel apertures parallel to the columns of pixels has a profile which increases towards the edges of the pixel apertures relative to the centre of the pixel apertures.
13. A display apparatus according to claim 12, wherein the total height of the pixel
30 apertures parallel to the columns of pixels has a profile which has a flat central portion.

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14. A display apparatus according to any one of claims 11 to 13, wherein a representative width of said intensity profile is at most 75% of the pitch of the columns.
15. A display apparatus according to claim 14, wherein said representative width is 5 the width between the 5% and 95% cumulative integration points of said intensity profile.
16. An autostereoscopic display apparatus comprising:
 - a spatial light modulator comprising an array of pixels arranged in rows and 10 columns in a pixel plane, the pixels comprising pixel apertures having gaps therebetween with the gaps between the columns of pixels extending substantially parallel to the columns of pixels; and
 - a spatially multiplexing parallax element capable of directing light from successive columns of pixels towards successive ones of two or more viewing windows 15 in a nominal window plane,
 - wherein the pixel apertures repeat at a pitch equal to a representative width of the intensity profile of an image of a nominal human pupil in the nominal window plane formed in the pixel plane by the spatially multiplexing parallax element.
- 20 17. A display apparatus according to claim 16, wherein the pixel apertures of pixels of each colour have substantially the same, constant total height parallel to the columns of pixels.
- 25 18. A display apparatus according to claim 17, wherein the pixel apertures of pixels of different colours have substantially the same total height parallel to the columns of pixels.
- 30 19. A display apparatus according to any one of claims 16 to 18, wherein the pixel apertures of pixels of each colour have substantially the same width perpendicular to the columns.

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20. A display apparatus according to claim 19, wherein the pixel apertures of pixels of different colours have substantially the same width.
21. A display apparatus according to claim 19, wherein the pixel apertures of pixels of different colours have different widths to compensate for chromatic aberration.
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22. A display apparatus according to any one of claims 16 to 21, wherein along the rows of pixels, the pixels are arranged in groups consisting of a plurality of adjacent pixels of the same colour.
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23. A display apparatus according to claim 22, wherein the pixels of each group are commonly addressable.
24. A display apparatus according to any one of claims 16 to 23, wherein said representative width is the width between the 5% and 95% cumulative integration points of said intensity profile.
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25. An autostereoscopic display apparatus comprising:
a spatial light modulator comprising an array of pixels arranged in rows and columns in a pixel plane, the pixels comprising pixel apertures having gaps therebetween with the gaps between the columns of pixels extending substantially parallel to the columns of pixels; and
20 a spatially multiplexing parallax element capable of directing light from successive columns of pixels towards successive ones of two or more viewing windows in a nominal window plane,
25 wherein the total height of the pixel apertures parallel to the columns of pixels varies.

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26. A display apparatus according to claim 25, wherein the total height of the pixel apertures parallel to the columns of pixels has a profile which increases towards the edges of the pixel apertures relative to the centre of the pixel apertures.
- 5 27. A display apparatus according to claim 26, wherein the total height of the pixel apertures parallel to the columns of pixels has a profile which has a flat central portion.
- 10 28. A display apparatus according to any one of claims 25 to 27, wherein a representative width of the intensity profile of an image of a nominal human pupil in the nominal window plane formed in the pixel plane by the spatially multiplexing parallax element is at most 75% of the pitch of the columns.
- 15 29. A display apparatus according to claim 28, wherein said representative width is the width between the 5% and 95% cumulative integration points of said intensity profile.
30. A display apparatus according to any one of the preceding claims, wherein the rows and columns are perpendicular to each other.
- 20 31. A display apparatus according to any one of the preceding claims, wherein the display apparatus is switchable between a first mode in which the spatially multiplexing parallax element is effective to direct light from successive columns of pixels towards an alternate one of two viewing windows and a second mode in which the spatially multiplexing parallax element has no effect.
- 25 32. A display apparatus according to any one of the preceding claims, wherein the spatially multiplexing parallax element has a structure which is uniform in a direction parallel to the columns of pixels and which repeats in a direction parallel to the rows of pixels.

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33. A display apparatus according to any one of the preceding claims, wherein the spatially multiplexing parallax element is a lenticular array.
34. A display apparatus according to any one of the preceding claims, wherein the spatially multiplexing parallax element has a structure which repeats at a pitch which is substantially an integer multiple of the pitch of the columns of the array of pixels.
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35. A display apparatus according to any one of the preceding claims, wherein the pitch of the windows in the nominal viewing plane is less than 55mm.